Complete Summary

GUIDELINE TITLE

Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults.

BIBLIOGRAPHIC SOURCE(S)

National Collaborating Centre for Acute Care. Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults. London (UK): National Institute for Clinical Excellence (NICE); 2003 Jun. 248 p. [373 references]

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Head injury (head trauma)

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Treatment

CLINICAL SPECIALTY

Critical Care
Dentistry
Emergency Medicine
Family Practice
Internal Medicine
Neurological Surgery
Neurology
Nursing
Pediatrics
Radiology

INTENDED USERS

Advanced Practice Nurses
Dentists
Emergency Medical Technicians/Paramedics
Health Care Providers
Hospitals
Nurses
Patients
Physical Therapists
Physicians
Psychologists/Non-physician Behavioral Health Clinicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

To ensure the best practice and care for the early management of patients with head injury

TARGET POPULATION

All patients (infants, children, adults) who present with a suspected or confirmed traumatic head injury with or without other major trauma

Note: The guideline does not provide advice on the management of patients with other traumatic injury to the head (e.g., to the eye or face).

INTERVENTIONS AND PRACTICES CONSIDERED

Pre-hospital Management and Accident and Emergency Department Assessment

1. Use of Advanced Trauma Life Support (ATLS) system and the Advanced Paediatric Life Support (APLS) system
2. Cervical spine immobilization
3. Referral criteria and appropriate procedures for patient transfer to hospital
4. Use of standby and alerting calls to the accident and emergency (A&E) department
5. Stabilisation of airways, breathing and circulation (ABC)
6. Assessment of risk factors on patient selection and urgency for imaging of the head and cervical spine

7. Resuscitation procedures
8. Assessment of coexisting injuries
9. Use of Glasgow Coma Scale (GCS)
10. Use of paediatric version of the GCS
11. Use of systemic and local analgesia
12. Use of telephone advice services (for example, National Health Service [NHS] Direct, A&E helplines)
13. Use of public health literature
14. Availability of information sheets detailing the nature of head injury and any investigations likely to be used
15. Information and support for carers and relatives

Investigations for Clinically Important Brain and Cervical Spine Injuries

1. Computed tomography (CT) imaging of the head and cervical spine
2. Magnetic resonance imaging (MRI) of the head and cervical spine (not currently indicated as the primary investigation for clinically important brain injury)
3. Skull x-ray
4. Three-view plain radiographs of the cervical spine
5. Patient selection criteria of patients for CT imaging of the head and cervical spine
6. Imaging of the head and cervical spine in children and infants
7. Urgency in performing CT imaging of the head and cervical spine
8. Use of adult rules with infants and children
9. Radiation exposure management

Transfer of Patients (Adults and Children) from Secondary to Tertiary Care Settings

1. Criteria for intubation and ventilation
2. Appropriate sedation and analgesia

Hospital Admission and Observation

1. Criteria for hospital admission
2. Appropriate training for all staff caring for patients with head injury
3. Specific training for the observation of infants and young children
4. Practice in paediatric coma observation and recording as detailed by the National Paediatric Neuroscience Benchmarking Group
5. Use of standard head injury proforma
6. In-hospital observation of patients procedures
7. Use of minimum documented observations
8. Frequency of observations
9. Observation of children and infants
10. Patient changes requiring review while under observation
11. Imaging following confirmed patient deterioration
12. Investigations for non-accidental injury in children

Discharge

1. Discharge advice (written and verbal)

2. Appropriate provision of information and advice on alcohol or drug misuse
3. Discharge of specific patient groups (e.g., low-risk patients, patients with normal imaging of the cervical spine, patients admitted for observation, patients at risk of non-accidental injury, patients with no carer at home)
4. Outpatient follow-up appointments
5. Neurorehabilitation
6. Provision of information and advice for patients and carers about long-term problems and support services
7. Communication with community services

MAJOR OUTCOMES CONSIDERED

- Clinically important brain injury (primary outcome of interest)
- Need for neurosurgical intervention
- Intracranial haematoma
- Intracranial injury
- Computed tomography and radiographic ordering rate
- Clinically important cervical spine fracture and unimportant spine fracture
- Need for internal or external fixation of the cervical spine

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The following databases were searched for literature for the period 1990 to 2002:

- Medline
- Embase
- The Cochrane Library - this includes: Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effectiveness (DARE), and Cochrane Controlled Trials Register (CCTR)
- Health Technology Assessment (HTA) Database
- National Health Service (NHS) Economic Evaluations Database (NHS-EED)
- System for Information on Grey Literature in Europe (SIGLE)
- Health Management Information Consortium (HMIC)

In addition, reference lists of previous guidelines and key papers were used to identify other key references, including pre-1990 literature. Experts were contacted to identify other key literature. Grey literature was identified using National Institute for Health and Clinical Excellence (NICE) stakeholder contacts. The following web sites were also searched:

- Agency for Healthcare Research and Quality (AHRQ)
- Brain Trauma Foundation
- CMA Infobase - clinical practice guidelines

- Department of Health
- http://www.google.com
- National Guideline Clearinghouse (USA)
- National Research Register (NRR)
- Organising Medical Networked Information (OMNI)
- Scottish Intercollegiate Guideline Network
- Turning Research into Practice (TRIP) Database

Systematic Review of Indications for Computed Tomography (CT) of the Head

This systematic review aimed to identify highly sensitive and specific clinical decision rules which could be used to select patients who are at high risk of clinically important brain injury, and who therefore should have CT imaging of the head. This search produced 1,454 abstracts in MEDLINE and 680 abstracts in EMBASE (after duplicates with MEDLINE were excluded). An initial screen for relevance was carried out by one systematic reviewer, which reduced the number of abstracts to 174 in MEDLINE and 68 in EMBASE. These abstracts were then independently read by two reviewers to identify those papers that should be obtained and read in full. At this point the only criteria used was the likelihood that the paper described a rule for the diagnosis of intracranial haematoma (ICH), clinically important brain injury, or need for a neurosurgical intervention in patients who have recently sustained a head injury, and produced some data on the likely sensitivity and specificity of the rule. Both derivation and validation papers were selected.

The independent reviewing process produced 72 papers in MEDLINE and 20 papers in EMBASE. In total 92 papers were deemed worthy of review.

Systematic Review of Indications for Imaging of the Cervical Spine

This systematic review aimed to identify clinical decision rules which could be used to select patients who are at high risk of clinically important cervical spine fracture, and who therefore should have three view plain radiography followed by other imaging if these prove inadequate.

This search produced 863 abstracts in MEDLINE and 268 in EMBASE (after duplicates had been removed). An initial screen for relevance was carried out by one systematic reviewer, which reduced the number of abstracts to 142 papers in MEDLINE and 10 papers in EMBASE. These abstracts were then independently read by two reviewers to identify those papers that should be obtained and read in full. At this point the only criteria used was the likelihood that the paper described a rule for the diagnosis of cervical fracture, and produced some data on the likely sensitivity and specificity of the rule. Both derivation and validation papers were selected.

The independent reviewing process produced 78 papers in MEDLINE and 7 papers in EMBASE. In total 85 papers were deemed worthy of review.

Systematic Review of Means of Identifying Patients at High Risk of Late Sequelae Following Head Injury

This systematic review aimed to identify clinical decision rules that could be used to select patients who are at high risk of late sequelae following head injury, and who therefore should be followed up so that potential long-term problems can be identified.

The original search for CT algorithms for the identification of prognostic variables for intracranial haematoma produced 1,454 abstracts in MEDLINE and 680 abstracts in EMBASE (after duplicates with MEDLINE were excluded). This full abstract list was reviewed to look for papers that may be of relevance to disability. After this a search was performed on Medline and Embase, listed in Appendix 1 of the full version of the original guideline document for prognosis of minor/mild head injury. Experts were also contacted for relevant papers. The search of the 1,454 abstracts revealed 152 potentially interesting papers. The additional MEDLINE and EMBASE search revealed 48 papers not previously seen, of which eight abstracts looked to be of relevance. Experts provided three useful papers. These abstracts were then independently read by two reviewers to identify those papers that should be obtained and read in full. At this point the only criteria used was the likelihood that the paper might describe a rule or provide factors in the acute assessment of the patient that might predict post-concussional syndrome. After this assessment 23 papers were selected for review.

Systematic Review of Medical Radiation Risks

This review aimed to provide simple estimates of the radiation risks associated with CT of the head. The search produced 654 abstracts in MEDLINE and 260 in EMBASE (after duplicates had been removed). A search using the Google search engine revealed useful documents from the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the National Radiological Protection Board (NRPB). Personal communications with the National Radiological Protection Board also provided papers and data which contributed to the review. Following abstract review and including the papers supplied by experts, 80 full articles were obtained and were reviewed to determine relevance. This identified 16 documents considered of relevance and these contributed to the text of this guideline.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Evidence Categories

The levels of evidence used for studies on the development of clinical decision rules were as follows:

1. Cohort study with consecutive patients and good reference standards, used to validate clinical decision rules
2. Cohort study with consecutive patients and good reference standards used to derive clinical decision rules (or validated on split samples only)
3. Non-consecutive study or without consistently applied reference standards
4. Case-control study, poor or non-independent reference standard
5. Expert opinion without explicit critical appraisal, or based on physiology, bench research or 'first principles'

The levels of evidence used for systematic reviews were as follows:

1. Systematic review (with homogeneity) of mostly Level 1 studies
2. Systematic review (with homogeneity) of mostly Level 2 studies
3. Systematic review (with homogeneity) of mostly Level 3 studies

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

The systematic reviews performed for these guidelines were designed to identify different types of clinical decision rule. The studies reviewed included derivation designs (usually cohort studies where the predictive power of a number of prognostic variables were explored) and validation designs (where the sensitivity and specificity of previously defined rules were examined). Data collection may have been prospective or retrospective. The follow-up rate for important outcomes was also recorded: a standard of at least 80% follow-up is often stated for studies on the development of clinical decision rules. The use of multivariate statistics to identify the independent contribution of each variable to the rules was also an important determinant of study quality. Systematic reviews of studies on the development of clinical decision studies and/or prognostic variables in head injury were also sought.

Systematic Review of Indications for Computed Tomography (CT) of the Head

A brief description of the rule proposed was extracted. Many papers do not provide explicit description of the diagnostic strategies, inclusion criteria, or post-diagnosis management strategies (e.g., eligibility for early discharge). The participant descriptions extracted were Glasgow Coma Score (GCS) levels, age, prevalence of important outcomes (especially intracranial haemorrhage) and the main inclusion and exclusion criteria. If a non-consecutive sample was described (e.g., selection criteria was CT imaging where 100% CT imaging was not the rule being tested) this was noted. The outcomes extracted included the need for neurosurgery, intracranial haematoma (ICH), intracranial injury and clinically important brain injury, and CT ordering rate. Data on specificity and sensitivity were recorded where possible; 95% confidence intervals were also recorded or calculated if possible.

Systematic Review of Indications for Imaging of the Cervical Spine

A brief description of the rule proposed was extracted. Many papers did not provide an explicit description of the diagnostic strategies, inclusion criteria, or postdiagnosis management strategies (e.g., eligibility for early discharge). Participant details extracted included symptom status, alertness, age, number of centres, prevalence of important outcomes, the country of study, and the main inclusion and exclusion criteria. The outcomes that the rule is intended to detect were noted. These included clinically important cervical fracture, unimportant cervical spine fracture, need for surgery and internal or external fixation. The radiography ordering rate was also noted as an outcome. Data on specificity and sensitivity were recorded where possible; 95% confidence intervals were also recorded or calculated if possible.

Systematic Review of Means of Identifying Patients at High Risk of Late Sequelae Following Head Injury

A brief description of the rule proposed was extracted. Only one paper actually proposed a rule. Participant description focused on GCS levels, age, and the main inclusion and exclusion criteria. The outcome measures used were extracted. The definitions of long-term disability or post-concussive were heterogeneous. Data on specificity and sensitivity were recorded where possible. As only one paper provided a rule, these figures could only be calculated for this one paper. The prevalence of important outcomes was also recorded. A previous systematic review was also available to the project team and this informed the review.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

A Guideline Development Group representing all relevant professional and patient parties was formed in December 2001, under the Chairmanship of Professor David Yates from the Trauma Audit and Research Network. Guideline Development Group meetings were held on the following dates:

- January 23rd 2002
- March 14th 2002
- May 2nd 2002
- June 6th 2002
- July 25th 2002
- September 11th 2002

Formal consensus methods were used to generate agreement regarding the recommendations for these guidelines. Consensus was used for all grades of recommendation, even those based on level one evidence, to ensure complete "sign-up" by all Guideline Development Group members to the final guidelines.

An initial set of recommendations was circulated in questionnaire format, and Guideline Development Group members rated their agreement with each recommendation on a nine point scale (strongly disagree to strongly agree).

Separate ratings were made where relevant for infants, children, and adults. A meeting was then held on July 25th 2002 to discuss the recommendations in the light of Guideline Development Group responses to the questionnaire. A revised set of recommendations was drawn up following the meeting and again circulated to Guideline Development Group members for their appraisal. At this stage there was near complete agreement with all recommendations, and only minor revisions in wording were required. The recommendations presented in this guideline are the result of the consensus exercise.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Recommendation Grades

Grade A - Consistent level 1 studies

Grade B - Consistent level 2 or 3 studies or extrapolations from level 1 studies

Grade C - Level 4 studies or extrapolations from level 2 or 3 studies

Grade D - Level 5 evidence or troublingly inconsistent or inconclusive studies of any level

COST ANALYSIS

The guideline development group identified two main areas where the potential impact of alternative strategies could be substantial:

- Diagnosis of clinically important brain injuries in patients with minor head injuries
- Identifying cervical spine damage in patients with head injury

A third area, identification of patients most likely to experience long-term sequelae, was also considered for economic evaluation. However, the lack of satisfactory clinical decision rules in this area means that this area remains an issue only on the research agenda at this time.

For both of the identified areas, a review of the literature was conducted followed by simple economic modelling of the cost-effectiveness in England and Wales of different strategies.

Using the same search strategy as for the main systematic reviews (but with an additional filter to locate costing information), a search (see Appendix 1 of the full version of the original guideline document) was performed of:

- Medline (PubMED)
- Embase
- Health Economic Evaluations Database (HHED) - http://www.ohe-heed.com.
- National Health Service Economic Evaluations Database (NHS EED) - http://www.york.ac.uk/inst/crd/nhsdhp.htm.

These strategies were designed to find any economic study related to head injury. Abstracts and database reviews of papers found were reviewed by the health economist and were discarded if they appeared not to contain any economic data or if the focus of the paper was not imaging after trauma. Relevant references in the bibliographies of reviewed papers were also identified and reviewed.

Health economics evidence was available for the following areas:

- Intracranial haematoma
- Cervical spine injuries imaging of the head
- Imaging of the cervical spine

Summary of Findings

A simple cost model demonstrated that some strategies that increase head CT scanning could potentially reduce costs if patients that have a negative scan are discharged without admission. However, other strategies that lead to a very high CT scanning rate are likely to increase health service costs. The imprecision of the data available (unit costs and test frequencies) means that it is not possible to identify with any degree of certainty those specific strategies that will increase cost and those that will decrease cost. Furthermore there are health outcomes and some additional changes to resource use that cannot be quantified using currently available data.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

A number of stakeholders from various organizations commented on draft versions of these guidelines, and are listed in the full version of the original guideline document.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Levels of evidence (1-5) and grading of recommendations (A-D) are defined at the end of the "Major Recommendations" field.

<u>Pre-hospital Assessment, Advice, and Referral to Hospital</u>

Glasgow Coma Scale

The assessment and classification of patients who have sustained a head injury should be guided primarily by the adult and paediatric versions of the Glasgow Coma Scale (GCS) and its derivative the Glasgow Coma Score. Recommended versions are shown in Appendices 13 and 14 of the full version of the original

guideline document. Good practice in the use of the Glasgow Coma Scale and Score should be adhered to at all times, using the following principles.

D - Monitoring and exchange of information about individual patients should be based on the three separate responses on the GCS (for example, a patient scoring 13 based on scores of 4 on eye-opening, 4 on verbal response, and 5 on motor response should be communicated as E4, V4, M5).

D - If a total score is recorded or communicated, it should be based on a sum of 15, and to avoid confusion this denominator should be specified (for example, 13/15).

D - The individual components of the GCS should be described in all communications and every note and should always accompany the total score.

D - The paediatric version of the GCS should include a "grimace" alternative to the verbal score to facilitate scoring in pre-verbal or intubated patients.

D - Best practice in paediatric coma observation and recording as detailed by the National Paediatric Neuroscience Benchmarking Group should be followed at all times. These principles are detailed in Appendix 13 of the full version of the original guideline document.

Public Health Literature

D - Public health literature and other non-medical sources of advice (for example, St John Ambulance, police officers) should encourage people who have any concerns following a head injury to themselves or to another person, regardless of the injury severity, to seek immediate medical advice.

Telephone Advice Lines

D - Telephone advice services (e.g., National Health Service (NHS) Direct, Accident & Emergency (A&E) helplines) should refer people who have sustained a head injury to the emergency ambulance services (i.e., 999) for emergency transport to A&E if they have experienced any of the following (alternative terms to facilitate communication are in parentheses):

- Unconsciousness or lack of full consciousness (e.g., problems keeping eyes open)
- Any focal (i.e., restricted to a particular part of the body or a particular activity) neurological deficit since the injury (examples include problems understanding, speaking, reading, or writing; loss of feeling in part of the body; problems balancing; general weakness; any changes in eyesight; and problems walking)
- Any suspicion of a skull fracture or penetrating head injury (e.g., clear fluid running from the ears or nose, black eye with no associated damage around the eye, bleeding from one or both ears, new deafness in one or both ears, bruising behind one or both ears, penetrating injury signs, visible trauma to the scalp or skull)
- Any seizure ("convulsion" or "fit") since the injury

- A high-energy head injury (e.g., pedestrian struck by motor vehicle, occupant ejected from motor vehicle, a fall from a height of greater than 1 metre or more than five stairs, diving accident, high-speed motor vehicle collision, rollover motor accident, accident involving motorised recreational vehicles, bicycle collision, or any other potentially high-energy mechanism). A lower threshold for height of falls should be used when dealing with infants and young children (i.e., aged less than 5 years).
- The injured person or their carer is incapable of transporting the injured person safely to the hospital A&E department without the use of ambulance services (providing any other risk factors indicating A&E referral are present).

D - Telephone advice services (for example, NHS Direct, A&E helplines) should refer people who have sustained a head injury to a hospital A&E department if the history related indicates the presence of any of the following risk factors (alternative terms to facilitate communication are in parentheses):

- Any previous loss of consciousness ("knocked out") as a result of the injury, from which the injured person has now recovered
- Amnesia for events before or after the injury ('"problems with memory"). The assessment of amnesia will not be possible in pre-verbal children and is unlikely to be possible in any child less than 5 years.
- Persistent headache since the injury
- Any vomiting episodes since the injury
- Any previous cranial neurosurgical interventions ("brain surgery")
- History of bleeding or clotting disorder
- Current anticoagulant therapy such as warfarin
- Current drug or alcohol intoxication
- Age greater than or equal to 65 years
- Suspicion of non-accidental injury
- Irritability or altered behaviour ("easily distracted," "not themselves," "no concentration," "no interest in things around them") particularly in infants and young children (i.e., aged under 5 years)
- Continuing concern by the helpline personnel about the diagnosis

D - In the absence of any of the above factors, the helpline should advise the injured person to seek medical advice from community services (for example, general practice) if any of the following factors are present:

- Adverse social factors (for example, no one able to supervise the injured person at home)
- Continuing concern by the injured person or their carer about the diagnosis

Community Health Services and NHS Minor Injury Clinics

D - Community health services (General Practice, paramedics, NHS walk-in centres, dental practitioners) and NHS minor injury clinics should refer patients who have sustained a head injury to a hospital A&E department, using the ambulance service if deemed necessary if any of the following is present.

- GCS less than 15 at any time since injury
- Any loss of consciousness as a result of the injury

- Any focal neurological deficit since the injury (examples include problems understanding, speaking, reading, or writing; decreased sensation; loss of balance; general weakness; visual changes; abnormal reflexes; and problems walking)
- Any suspicion of a skull fracture or penetrating head injury since the injury (e.g., clear fluid running from the ears or nose, black eye with no associated damage around the eyes, bleeding from one or both ears, new deafness in one or both ears, bruising behind one or both ears, penetrating injury signs, visible trauma to the scalp or skull of concern to the professional)
- Amnesia for events before or after the injury. The assessment of amnesia will not be possible in pre-verbal children and is unlikely to be possible in any child aged under 5 years.
- Persistent headache since the injury
- Any vomiting episodes since the injury (clinical judgement should be used regarding the cause of vomiting in those aged less than or equal to 12 years, and whether referral is necessary)
- Any seizure since the injury
- Any previous cranial neurosurgical interventions
- A high-energy head injury (e.g., pedestrian struck by motor vehicle, occupant ejected from motor vehicle, a fall from a height of greater than 1 metre or more than five stairs, diving accident, high-speed motor vehicle collision, rollover motor accident, accident involving motorized recreational vehicles, bicycle collision, or any other potentially high-energy mechanism). A lower threshold for height of falls should be used when dealing with infants and young children (i.e., aged under 5 years).
- History of bleeding or clotting disorder
- Current anticoagulant therapy such as warfarin
- Current drug or alcohol intoxication
- Age greater than or equal to 65 years
- Suspicion of non-accidental injury
- Continuing concern by the professional about the diagnosis

D - In the absence of any of the above factors, the professional should consider referral to A&E if any of the following factors are present depending on their own judgement of severity.

- Irritability or altered behaviour, particularly in infants and young children (i.e., aged under 5 years)
- Visible trauma to the head not covered above but still of concern to the professional
- Adverse social factors (for example, no one able to supervise the injured person at home)
- Continuing concern by the injured person or their carer about the diagnosis

Transport From Community Health Services and NHS Minor Injury Clinics

D - Patients referred from community health services and NHS minor injury clinics should be accompanied by a competent adult during transport to A&E. The referring professional should determine if an ambulance is required, based on the patient's clinical condition. If an ambulance is deemed not to be required, public transport and car are appropriate means of transport providing the patient is accompanied. The referring professional should inform the destination hospital (by

phone) of the impending transfer, and in non-emergencies a letter summarising signs and symptoms should be sent with the patient.

Training in Risk Assessment

D - It is recommended that general practitioners (GPs), nurse practitioners, dentists, and paramedics should all be capable of assessing the presence or absence of the risk factors listed in the section above titled "Community Health Services and NHS Minor Injury Clinics." There is some evidence that paramedics using written triage guidelines in a United States context may fall short of acceptable levels of triage accuracy. The Guideline Development Group is under the impression that the triage skills of other community professionals may sometimes be below a desirable standard. Training should be available as required to ensure head injury triage accuracy in paramedics, GPs, nurse practitioners, and dentists.

Immediate Management at the Scene and Transport to Hospital

Pre-hospital Management

The following principles should be adhered to in the immediate care of patients who have sustained a head injury.

D - Patients who have sustained a head injury should initially be assessed and managed according to clear principles and standard practice as embodied in the Advanced Trauma Life Support (ATLS) system, and for children the Advanced Paediatric Life Support (APLS) system.

D - Paramedics should be fully trained in the use of the adult and paediatric versions of the GCS and its derived score.

D - Paramedics should have some training in the detection of non-accidental injury and should pass this information to A&E personnel when the relevant signs and symptoms arise.

D - The first priority for those administering immediate care is to treat first the greatest threat to life and avoid further harm.

D - Patients who have sustained a head injury should be transported directly to a facility that has been identified as having the resources necessary to expeditiously assess and intervene to optimise outcome. It is expected that all acute hospitals accepting patients who have sustained a head injury should have these resources, and that these resources should be appropriate for the patient's age.

D - Patients who have sustained a head injury and present with any of the following risk factors should have full cervical spine immobilisation attempted unless other factors prevent this:

- GCS less than 15 at any time since the injury
- Neck pain or tenderness
- Focal neurological deficit

- Paraesthesia in the extremities
- Any other clinical suspicion of cervical spine injury

D - Cervical spine immobilisation should be maintained until full risk assessment (and imaging if deemed necessary) indicates it is safe to remove the immobilisation device.

D - Standby calls to the destination A&E department should be made for all patients with a GCS less than or equal to 8, to ensure appropriately experienced professionals are available for their treatment and to prepare for imaging.

D - An alerting call to the destination A&E department should be made for all patients with a GCS less than 15.

Assessment in A&E

Focus of A&E Assessment in Patients with a Head Injury

D - The main focus of A&E assessment for patients who have sustained a head injury should be the risk of clinically important brain injuries and injuries to the cervical spine and the consequent need for imaging. Due attention should also be paid to co-existing injuries and to other concerns the clinician may have (e.g., non-accidental injury, possible non-traumatic aetiology such as seizure). Early imaging, rather than admission and observation for neurological deterioration, will reduce the time to detection of life-threatening complications and is associated with better outcomes.

Primary Investigations for Clinically Important Brain Injuries

A - The current primary investigation of choice for the detection of acute clinically important brain injuries is computed tomography (CT) imaging of the head.

D - For safety, logistic, and resource reasons, magnetic resonance imaging (MRI)scanning is not currently indicated as the primary investigation for clinically important brain injury in patients who have sustained a head injury, although it is recognised that additional information of importance to the patient's prognosis can sometimes be detected using MRI. MRI is contraindicated in both head and cervical spine investigations unless there is absolute certainty that the patient does not harbour an incompatible device, implant, or foreign body. There should be appropriate equipment for maintaining and monitoring the patient within the MRI environment and all staff involved should be aware of the dangers and necessary precautions for working near an MRI scanner. MRI safety, availability, and speed may improve in the future to the point where it becomes a realistic primary investigation option for head injury.

D - Skull x-rays have a role in the detection of non-accidental injury in children (see section below titled "Non-Accidental Injury in Children").

D - Skull x-rays in conjunction with high-quality in-patient observation also have a role where CT scanning resources are unavailable.

Selection of Patients for CT Imaging of the Head

B - Patients who have sustained a head injury and present with any one of the following risk factors should have CT scanning of the head immediately requested:

- GCS less than 13 at any point since the injury
- GCS equal to 13 or 14 at 2 hours after the injury
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture (haemotympanum, "panda" eyes, cerebrospinal fluid otorrhoea, Battle's sign)
- Post-traumatic seizure
- Focal neurological deficit
- More than one episode of vomiting (clinical judgement should be used regarding the cause of vomiting in those aged 12 years or younger, and whether imaging is necessary)
- Amnesia for greater than 30 minutes of events before impact. The assessment of amnesia will not be possible in pre-verbal children and is unlikely to be possible in any child aged under 5 years.

B - CT should also be immediately requested in patients with any of the following risk factors, provided they have experienced some loss of consciousness or amnesia since the injury:

- Age greater than or equal to 65 years
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin)
- Dangerous mechanism of injury (a pedestrian struck by a motor vehicle, an occupant ejected from a motor vehicle, or a fall from a height of greater than 1 metre or five stairs). A lower threshold for height of falls should be used when dealing with infants and young children (i.e., aged under 5 years).

Preferred Investigations for the Cervical Spine

B - The current investigations of choice for the detection of injuries to the cervical spine are three-view plain radiographs of good technical quality. Where it is not possible to achieve the cervical spine views desired with x-ray, CT imaging is indicated. CT is also indicated if the plain film series is technically inadequate (for example, desired view unavailable), suspicious, or definitely abnormal or if there is continued clinical suspicion of injury despite a normal study. CT imaging of the cervical spine should be considered if the patient is having other body areas scanned for head injury/multi-region trauma, and a definitive diagnosis of cervical spine injury is required urgently.

B - As a minimum, CT should cover any areas of concern or uncertainty on plain film or clinical grounds. With modern multislice scanners the whole cervical spine can be scanned at high resolution with ease and multiplanar reformatted images generated rapidly. Facilities for multiplanar reformatting and interactive viewing should be available.

B - MRI is indicated in the presence of neurological signs and symptoms referable to the cervical spine and if there is suspicion of vascular injury (e.g., subluxation or displacement of the spinal column, fracture through foramen transversarium or

lateral processes, posterior circulation syndromes). MRI may add important information about soft tissue injuries associated with bony injuries demonstrated by plain films and/or CT. MRI has a role in the assessment of ligamentous and disc injuries suggested by plain films, CT, or clinical findings.

B - In CT, the occipital condyle region should be routinely reviewed on "bone windows" for patients who have sustained a head injury. Reconstruction of standard head images onto a high-resolution bony algorithm is readily achieved with modern CT scanners.

B - In patients who have sustained high-energy trauma or are showing signs of lower cranial nerve palsy, the results of initial imaging should be considered and particular attention should be paid to the region of the foramen magnum. If necessary, additional high-resolution imaging for coronal and sagittal reformatting should be performed while the patient is on the scanner table.

Cervical Spine Imaging of Infants and Children

D - Children aged 10 years or more can be treated as adults for the purposes of cervical spine imaging. In children under 10 years, because of the increased risks associated with irradiation, particularly to the thyroid gland, and the generally lower risk of significant spinal injury, CT of the cervical spine should only be used in exceptional circumstances (for example, cases where there is a strong suspicion of injury despite normal plain films, or cases where there is a strong suspicion of injury and plain films are inadequate).

D - Children under 10 years should receive anterior/posterior and lateral views without an anterior/posterior peg view. Abnormalities or uncertainties in those under 10 years should be clarified by CT imaging. Minor trauma associated with subsequent torticollis results in plain films that are almost uninterpretable and CT is very helpful in this situation.

Selection of Patients Who Have Sustained Head Injury for Imaging of the Cervical Spine

A - Patients with any one of the following risk factors should have three-view radiograph imaging of the cervical spine immediately requested.

- GCS less than 15 at the time of assessment
- Paraesthesia in the extremities
- Focal neurological deficit
- Not possible to test for range of motion in the neck (safe assessment of range of motion can be performed with the following: simple rear-end motor vehicle collision, sitting position in A&E, ambulatory at any time since injury, delayed onset of neck pain, absence of midline cervical spine tenderness)
- Patient not able to actively rotate neck to 45 degrees to the left and right (if assessment is possible)

A - Cervical spine imaging should also be immediately requested in the patients with the following risk factors provided they have some neck pain or tenderness.

- Age greater than or equal to 65 years
- Dangerous mechanism of injury (fall from greater than 1 metre or five stairs; axial load to head [for example, diving]; high-speed motor vehicle collision greater than 65 miles per hour; rollover motor accident; ejection from a motor vehicle; accident involving motorised recreational vehicles; bicycle collision). A lower threshold for height of falls should be used when dealing with infants and young children (i.e., aged under 5 years).

Using Adult Rules with Infants and Children

D - As the best evidence on selecting patients with head injury for imaging exists for adults, and children and infants have a lower risk of brain and cervical spine injury than adults, validated adult rules on imaging of the head and cervical spine may be safely used in children and infants.

Non-accidental Injury in Children

D - Due to the distinct pattern of injuries involved, skull x-ray as part of a series of plain x-rays (skeletal survey), along with other well-established examinations (for example, ophthalmoscopic examination for retinal haemorrhage; examination for pallor, anaemia, tense fontanelle) and investigations (e.g., CT, MRI), has a role in detecting non-accidental head injuries in children (that is, those aged under 12 years).

Good Practice in A&E Assessment

The following should be practiced during A&E assessment.

D - The priority for all A&E patients is the stabilisation of airways, breathing, and circulation (ABC) before attention to other injuries.

D - Depressed conscious level should be ascribed to intoxication only after a significant brain injury has been excluded.

D - All A&E clinicians involved in the assessment of patients with a head injury should be capable of assessing the presence or absence of the risk factors used in the Canadian CT-head and cervical spine rules as listed above in the sections titled "Selection of Patients for CT Imaging of the Head" and "Selection of Patients Who Have Sustained a Head Injury for Imaging of the Cervical Spine." Training should be available as required to ensure that this is the case.

D - Patients presenting to A&E with impaired consciousness (GCS less than 15) should be assessed immediately by a trained member of staff (e.g., triage nurse).

D - In patients with a GCS less than or equal to 8 there should be early involvement of an anaesthetist or critical care physician to provide appropriate airway management, as described below in the section titled "Transfer from Secondary to Tertiary Care Settings," and to assist with resuscitation.

D - All patients presenting to A&E with a head injury should be assessed by triage by a trained member of staff within a maximum of 15 minutes of arrival at

hospital. Part of this assessment should establish whether they are high risk or low risk for clinically important brain injury and/or cervical spine injury, using the Canadian CT-head rules and the Canadian cervical spine rules as modified for these guidelines.

D - Patients found to be high risk on triage for clinically important brain injury and/or cervical spine injury should be assessed within 10 minutes of triage by an A&E clinician. Part of this assessment should fully establish the need to request CT imaging of the head and/or imaging of the cervical spine. The Canadian CT-head rules and the Canadian cervical spine rules as listed above should again form the basis for the final decision on imaging after discussion with the radiology department.

D - Patients with head injury who are discovered to be at low risk for clinically important brain injury and/or cervical spine injury on initial triage should be assessed within a further hour by an A&E clinician. Part of this assessment should fully establish the need to request CT imaging of the head and/or imaging of the cervical spine. The Canadian CT-head rules and the Canadian cervical spine rules as listed above should again form the basis for the final decision on imaging after discussion with the radiology department.

D - In principle patients with head injury should not receive systemic analgesia until fully assessed so that an accurate measure of consciousness and other neurological signs can be made. Local anaesthetic should be delivered for fractured limbs or other painful injuries.

D - Throughout the hospital episode, all care professionals should use a standard head injury proforma in their documentation when assessing and observing patients with head injury. Excellent proformas have been produced in previous guidelines from the Scottish Intercollegiate Guidelines Network and the Royal College of Surgeons of England. A separate proforma for those under 16 years should be used. Areas to allow extra documentation should be included (e.g., in cases of non-accidental injury).

Examples of the proformas that should be used for patients with head injury are shown in Appendices 8 and 9 of the full version of the original guideline document.

Imaging Practice and Involvement of the Neurosurgical Department

Good Practice in Imaging of Patients with a Head Injury

D - All CT scans of the head should be reviewed by a clinician who has been deemed competent to review such images.

D - All plain radiographs of the cervical spine should be reviewed by a clinician who has been deemed competent to review such images.

D - Where necessary, transport or transmission of images should be used to ensure that a competent clinician review the images.

D - All imaging performed on patients with head injury should have a full or interim written report for the patients' notes within an hour of the procedure having been performed.

D - Imaging of any kind should not delay neurosurgical or anaesthetic referral in patients with severe head injury.

Urgency in Performing CT of the Head

B - CT imaging of the head should be performed (that is, imaging carried out and results analysed) within 1 hour of the request having been received by the radiology department in those patients where imaging is requested because of any of the following risk factors:

- GCS less than 13 at any point since the injury
- GCS equal to 13 or 14 at 2 hours after the injury
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture (haemotympanum, "panda" eyes, cerebrospinal fluid otorrhoea, Battle's sign)
- More than one episode of vomiting (clinical judgement should be used regarding the cause of vomiting in those aged less than or equal to 12 years, and whether imaging is necessary)
- Age greater than or equal to 65 years, providing that some loss of consciousness or amnesia has been experienced
- Post-traumatic seizure
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin) providing that some loss of consciousness or amnesia has been experienced
- Focal neurological deficit

B - Patients who have any of the following risk factors and none of the risk factors listed in the previous recommendation should have their CT imaging performed within 8 hours of the injury (imaging should be performed immediately in these patients if they present 8 hours or more after their injury):

- Amnesia for greater than 30 minutes of events before impact. The assessment of amnesia will not be possible in pre-verbal children and is unlikely to be possible in any child aged less than 5 years.
- Dangerous mechanism of injury (a pedestrian struck by a motor vehicle, an occupant ejected from a motor vehicle, or a fall from a height of greater than 1 metre or five stairs) providing that some loss of consciousness or amnesia has been experienced. A lower threshold for height of falls should be used when dealing with infants and young children (i.e., aged less than 5 years).

Cervical Spine Imaging Urgency

D - Imaging of the cervical spine should be performed within 1 hour of a request having been received by the radiology department. Where a request for urgent head CT (i.e., within 1 hour) has also been received, the cervical spine imaging should be carried out immediately.

Involving Neurosurgical Care

D - The care of all patients with new, surgically significant abnormalities on imaging should be discussed with a neurosurgeon. The definition of "surgically significant" should be developed by local neurosurgical centres and agreed with referring hospitals. An example of a neurosurgical referral letter is shown in Appendix 10 of the full version of the original guideline document.

D - The development of consensus on what constitutes a surgically significant abnormality following imaging of a patient with head injury should be prioritised by the Department of Health in conjunction with the Society of British Neurological Surgeons.

Other Reasons for Discussing a Patient's Care with a Neurosurgeon

D - Regardless of imaging, other reasons for discussing a patient's care plan with a neurosurgeon include:

- Persisting coma (GCS less than or equal to 8) after initial resuscitation
- Unexplained confusion which persists for more than 4 hours
- Deterioration in GCS score after admission (greater attention should be paid to motor response deterioration)
- Progressive focal neurological signs
- A seizure without full recovery
- Definite or suspected penetrating injury
- A cerebrospinal fluid leak

Transfer from Secondary to Tertiary Care Settings

D - There should be a designated consultant in the referring hospital with responsibility for establishing arrangements for the transfer of patients with head injuries to a neurosurgical unit and another consultant at the neurosurgical unit with responsibility for establishing arrangements for communication with referring hospitals and for receipt of patients transferred.

D - Local guidelines on the transfer of patients with head injuries should be drawn up between the referring hospital trusts and the neurosurgical unit and should be consistent with established national guidelines. Details of the transfer of the responsibility for patient care should also be agreed.

D - Thorough resuscitation and stabilisation of the patient should be completed before transfer to avoid complications during the journey. A patient persistently hypotensive despite resuscitation should not be transported until all possible causes of the hypotension have been identified and the patient stabilised.

D - All patients with a GCS less than or equal to 8 requiring transfer to tertiary care should be intubated and ventilated as should any patients with the indications detailed below.

D - Patients with head injuries should be accompanied by a doctor with at least 2 years' experience in an appropriate specialty (usually anaesthesia). They should

be familiar with the pathophysiology of head injury, the drugs and equipment they will use, working in the confines of an ambulance (or helicopter if appropriate) and have received supervised training in the transfer of patients with head injuries. They should have an adequately trained assistant. They should be provided with appropriate clothing for the transfer, medical indemnity, and personal insurance.

D - The transfer team should be provided with a means of communication with their base hospital and the neurosurgical unit during the transfer. A portable phone may be suitable providing it is not used in close proximity (i.e., within 1 metre) of medical equipment prone to electrical interference (e.g., infusion pumps).

D - Education, training and audit are crucial to improving standards of transfer; appropriate time and funding should be provided.

D - The following indications for intubation and ventilation after head injury should be used:

Immediately:

- Coma - not obeying commands, not speaking, not eye opening (i.e., GCS less than or equal to 8)
- Loss of protective laryngeal reflexes
- Ventilatory insufficiency as judged by blood gases: hypoxaemia (PaO_2 less than 9 kPa on air or less than 13 kPa on oxygen) or hypercarbia ($PaCO_2$ greater than 6 kPa)
- Spontaneous hyperventilation (causing $PaCO_2$ less than 3.5 kPa)
- Respiratory arrhythmia

Before the start of the journey:

- Significantly deteriorating conscious level, even if not coma
- Bilateral fractured mandible
- Copious bleeding into mouth (for example, from skull base fracture)
- Seizures

D - An intubated patient should be ventilated with muscle relaxation and appropriate sedation and analgesia. Aim for a PaO_2 greater than 13 kPa, $PaCO_2$ 4.5 to 5.0 kPa unless there is clinical or radiological evidence of raised intracranial pressure when more aggressive hyperventilation is justified.

D - Carers and relatives should have as much access to the patient as is practical during transfer and be fully informed on the reasons for transfer and the transfer process.

Transfer of Children

The recommendations in the section "Transfer From Secondary to Tertiary Care Settings" above were written for adults but the principles apply equally to children

and infants, providing that the paediatric modification of the Glasgow Coma Scale is used.

D - Service provision in the area of paediatric transfer to tertiary care should also follow the principles outlined in the National Service Framework for Paediatric Intensive Care. These do not conflict with the principles outlined in "Transfer from Secondary to Tertiary Care Settings" above.

D - Transfer of a child or infant to a specialist neurosurgical unit should be undertaken by staff experienced in the transfer of critically ill children. Families should have as much access to their child as is practical during transfer and be fully informed on the reasons for transfer and the transfer process.

Admission

D - The following patients meet the criteria for admission to hospital following a head injury:

- Patients with new, clinically significant abnormalities on imaging
- Patients who have not returned to GCS equal to 15 after imaging, regardless of the imaging results
- When a patient fulfils the criteria for CT scanning but this cannot be done within the appropriate period, either because CT is not available or because the patient is not sufficiently co-operative to allow scanning
- Continuing worrying signs of concern to the clinician (e.g., persistent vomiting, severe headaches)
- Other sources of concern to the clinician (e.g., drug or alcohol intoxication, other injuries, shock, suspected non-accidental injury, meningism, cerebrospinal fluid leak)

D - Some patients may require an extended period in a recovery setting due to the use of sedation or general anaesthetic during CT imaging. These patients should not normally require admission.

D - Patients with multiple injuries should be admitted under the care of the team that is trained to deal with their most severe and urgent problem.

Good Practice in Observation of Patients With Head Injury

D - In circumstances where a patient with a head injury requires hospital admission, it is recommended that the patient only be admitted under the care of a consultant who has been trained in the management of this condition during his/her higher specialist training.

D - It is recommended that in-hospital observation of patients with a head injury should only be conducted by professionals competent in the assessment of head injury.

Minimum Documented Observations

D - For patients admitted for head injury observation the minimum acceptable documented neurological observations are: GCS; pupil size and reactivity; limb movements; respiratory rate; heart rate; blood pressure; temperature; blood oxygen saturation.

Frequency of Observations

D - Observations should be performed and recorded on a half-hourly basis until GCS equal to 15 has been achieved. The minimum frequency of observations for patients with GCS equal to 15 should be as follows, starting after the initial assessment in A&E:

- Half-hourly for 2 hours
- Then 1 hourly for 4 hours
- Then 2 hourly thereafter

D - Should the patient with GCS equal to 15 deteriorate at any time after the initial 2-hour period, observations should revert to half-hourly and follow the original frequency schedule.

Patient Changes Requiring Review While Under Observation

D - Any of the following examples of neurological deterioration should prompt urgent reappraisal by the supervising doctor:

- Development of agitation or abnormal behaviour
- A sustained (i.e., for at least 30 minutes) drop of one point in GCS level (greater weight should be given to a drop of one point in the motor score of the GCS)
- Any drop of greater than two points in GCS level regardless of duration or GCS sub-scale
- Development of severe or increasing headache or persisting vomiting
- New or evolving neurological symptoms or signs such as pupil inequality or asymmetry of limb or facial movement

D - To reduce inter-observer variability and unnecessary referrals, a second member of staff competent to perform observation should confirm deterioration before involving the supervising doctor. This confirmation should be carried out immediately. Where a confirmation cannot be performed immediately (for example, no staff member available to perform the second observation) the supervising doctor should be contacted without the confirmation being performed.

Imaging Following Confirmed Patient Deterioration

D - An immediate CT scan should be considered in patients confirmed as having any of the changes noted directly above.

Further Imaging if GCS Equal to 15 Not Achieved at 24 Hours

D - In the case of a patient who has had a normal CT scan but who has not achieved GCS equal to 15 after 24 hours observation, a further CT scan or MRI scanning should be considered and discussed with the radiology department.

Observation of Children and Infants

D - Observation of infants and young children (i.e., aged less than 5 years) is a difficult exercise and therefore should only be performed by units with staff experienced in the observation of infants and young children with a head injury. Infants and young children may be observed in normal paediatric observation settings, as long as staff have the appropriate experience.

Training in Observation

D - Medical, nursing, and other staff caring for patients with head injury admitted for observation should all be capable of performing the observations listed above in the sections titled "Minimum Documented Observations" and "Patient Changes Requiring Review While Under Observation." The acquisition and maintenance of observation and recording skills requires dedicated training and this should be available to all relevant staff. Specific training is required for the observation of infants and young children.

Support for Families and Carers

D - There should be a protocol for all staff to introduce themselves to family members or carers and briefly explain what they are doing. In addition a photographic board with the names and titles of personnel in the hospital departments caring for patients with head injury can be helpful.

D - Information sheets detailing the nature of head injury and any investigations likely to be used should be available in the A&E Department. The patient version of these National Institute of Clinical Excellence (NICE) guidelines may be helpful.

D - Staff should consider how best to share information with children and introduce them to the possibility of long-term complex changes in their parent or sibling. Literature produced by patient support groups may be helpful.

D - Carers and relatives should be encouraged to talk and make physical contact (for example, holding hands) with the patient, although it is important for relatives and friends not to feel that they have to spend many hours at the bedside. It is important that they also have a break and sleep from time to time. This may be an opportune moment to mention patient support organisations and introduce their literature.

D - There should be a board/area displaying leaflets or contact details for patient support organisations either locally or nationally to enable family members to gather further information.

Discharge and Follow-up

Discharge of Low-risk Patients with GCS Equal to 15

D - If CT is not indicated on the basis of history and examination, the clinician may conclude that the risk of clinically important brain injury to the patient is low enough to warrant transfer to the community, as long as no other factors that would warrant a hospital admission are present (e.g., drug or alcohol intoxication, other injuries, shock, suspected non-accidental injury, meningism, cerebrospinal fluid leak) and there are appropriate support structures for safe transfer to the community and for subsequent care (e.g., competent supervision at home).

Discharge of Patients with Normal Imaging of the Head

D - After normal imaging of the head, the clinician may conclude that the risk of clinically important brain injury requiring hospital care is low enough to warrant transfer to the community, as long as the patient has returned to GCS equal to 15 and no other factors that would warrant a hospital admission are present (e.g., drug or alcohol intoxication, other injuries, shock, suspected non-accidental injury, meningism, cerebrospinal fluid leak) and there are appropriate support structures for safe transfer to the community and for subsequent care (e.g., competent supervision at home).

Discharge of Patients with Normal Imaging of the Cervical Spine

D - After normal imaging of the cervical spine the clinician may conclude that the risk of injury to the cervical spine is low enough to warrant transfer to the community, as long as the patient has returned to GCS equal to 15 and their clinical examination is normal and no other factors that would warrant a hospital admission are present (e.g., drug or alcohol intoxication, other injuries, shock, suspected nonaccidental injury, meningism, cerebrospinal fluid leak) and there are appropriate support structures for safe transfer to the community and for subsequent care (e.g., competent supervision at home).

Discharge of Patients Admitted for Observation

D - Patients admitted after a head injury may be transferred to the community after resolution of all significant symptoms and signs providing they have suitable supervision arrangements at home.

Discharge of Patients at Risk of Non-accidental Injury

D - No infants or children presenting with head injuries that require imaging of the head or cervical spine should be transferred to the community until assessed by a clinician experienced in the detection of non-accidental injury.

D - It is expected that all personnel involved in the triage and assessment of infants and children with head injury should have some training in the detection of non-accidental injury.

Discharge and GCS Status

D - No patients presenting with head injury should be transferred to the community until they have achieved GCS equal to 15, or normal consciousness in infants and young children as assessed by the paediatric version of the GCS.

Discharge Advice

D - All patients with any degree of head injury who are deemed safe for appropriate transfer to the community from A&E or the observation ward should receive verbal advice and a written head injury advice card. The details of the card should be discussed with the patients and their carers. If necessary (e.g., patients with literacy problems, visual impairment, or speaking languages without a written format), other formats (e.g., tapes) should be used to communicate this information. Communication in languages other than English should also be facilitated.

D - The risk factors outlined in the card should be the same as those used in the initial community setting to advise patients on A&E attendance. Patients and carers should also be alerted to the possibility that some patients may make a quick recovery but go on to experience delayed complications. Instructions should be included on contacting community services in the event of delayed complications.

D - Patients who presented to A&E with drug or alcohol intoxication and are now fit for discharge should receive information and advice on alcohol or drug misuse.

Suggested written advice cards for patients and carers are provided in Appendices 2, 3, and 4 of the full version of the original guideline document.

Discharge of Patients with No Carer at Home

D - All patients with any degree of head injury should only be transferred to their home if it is certain that there is somebody suitable at home to supervise the patient. Patients with no carer at home should only be discharged if suitable supervision arrangements have been organised or when the risk of late complications is deemed negligible.

Outpatient Appointments

D - Every patient who has undergone imaging of the head and/or been admitted to hospital (that is, those initially deemed to be at high risk for clinically important brain injury) should be referred to their GP for follow-up as a routine within a week after discharge. When such a patient experiences persisting problems, there should be an opportunity available for referral from primary care to an out-patient appointment with a professional trained in assessment and management of sequelae of brain injury (for example, clinical psychologist, neurologist, neurosurgeon, specialist in rehabilitation medicine).

Advice About Long-term Problems and Support Services

D - All patients and their carers should be made aware of the possibility of long-term symptoms and disabilities following head injury and should be made aware of the existence of services that they could contact should they experience long-term problems. Details of support services should be included on patient discharge advice cards. Patients should also be advised to contact their doctor about these problems.

Communication with Community Services

D - A communication (letter or e-mail) should be generated for all patients who have attended A&E with a head injury, and sent to the patient's GP within 1 week of the end of the hospital episode. This letter should include details of the clinical history and examination. This letter should be open to the person or their carer, or a copy should be given to them.

D - A communication (letter or e-mail) should be generated for all children who received head or cervical spine imaging, and sent to the relevant community paediatrician and school medical officer within 1 week of the end of the hospital episode. This letter should include details of the clinical history and examination.

D - A communication (letter or e-mail) should be generated for all infants who received head or cervical spine imaging, and sent to the relevant community paediatrician and health visitor within 1 week of the end of the hospital episode. This letter should include details of the clinical history and examination.

Re-attendees

B - Patients who return to an A&E department within 48 hours of transfer to the community with any persistent complaint relating to the initial head injury should be seen by or discussed with a senior clinician experienced in head injuries, and considered for a CT scan.

Medical Radiation

Radiation Exposure Management

D - In line with good radiation exposure practice, every effort should be made to minimise radiation dose during imaging of the head and cervical spine, while ensuring that image quality and coverage is sufficient to achieve an adequate diagnostic study.

D - In spite of the potential risks of increased radiation exposure as a result of these guidelines, the consensus opinion of the Guideline Development Group is that this is justified by the increased effectiveness in identifying and managing patients with significant brain injuries.

D - CT imaging of the cervical spine should only be used in exceptional circumstances in children aged less than 10 years.

Definitions:

Recommendation Grades

Grade A - Consistent level 1 studies

Grade B - Consistent level 2 or 3 studies or extrapolations from level 1 studies

Grade C - Level 4 studies or extrapolations from level 2 or 3 studies

Grade D - Level 5 evidence or troublingly inconsistent or inconclusive studies of any level

Evidence Categories

The levels of evidence used for studies on the development of clinical decision rules were as follows:

1. Cohort study with consecutive patients and good reference standards, used to validate clinical decision rules
2. Cohort study with consecutive patients and good reference standards used to derive clinical decision rules (or validated on split samples only)
3. Non-consecutive study or without consistently applied reference standards
4. Case-control study, poor or non-independent reference standard
5. Expert opinion without explicit critical appraisal, or based on physiology, bench research or 'first principles'

The levels of evidence used for systematic reviews were as follows:

1. Systematic review (with homogeneity) of mostly Level 1 studies
2. Systematic review (with homogeneity) of mostly Level 2 studies
3. Systematic review (with homogeneity) of mostly Level 3 studies

CLINICAL ALGORITHM(S)

Clinical algorithms are provided in the original guideline document for:

- Referral of people who have sustained a head injury by telephone health advice services (e.g. National Health Service (NHS) Direct, Hospital Accident and Emergency (A&E) Helpline) following normal evaluation of immediate medical needs
- Referral of patients with a head injury by community medical services (e.g. general practice, paramedics, NHS walk-in centres, dental practitioners or NHS minor injury clinic)
- Selection of patients with a head injury for computed tomography (CT) imaging of the head
- Selection of patients with a head injury for imaging of the cervical spine

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

General Benefits

Implementation of the recommendations may ensure that people with head injury receive consistent management and care to improve outcomes and minimize post head-injury deficits.

Specific Benefits

Patients most likely to benefit from the recommendations include those with life-threatening brain injuries that benefit from early detection and require early neurosurgical intervention.

POTENTIAL HARMS

Computed tomography (CT) scans result in radiation exposure which may be associated with an increased risk of cancer, particularly in children.

CONTRAINDICATIONS

CONTRAINDICATIONS

Magnetic resonance imaging (MRI) is contraindicated in both head and cervical spine investigations unless there is absolute certainty that the patient does not harbour an incompatible device, implant, or foreign body.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

This guidance represents the view of the Institute, which was arrived at after careful consideration of the evidence available. Health professionals are expected to take it fully into account when exercising their clinical judgment. The guidance does not, however, override the individual responsibility of health professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Local health communities should review their existing practice for the triage, assessment, investigation and early management of head injury in infants, children, and adults against this guideline as they develop their Local Delivery Plans. The review should consider the resources required to implement the recommendations set out in Section 1 of the short version of original guideline document (and in the "Major Recommendations" section of this summary), the people and processes involved, and the timeline over which full implementation is envisaged. It is in the interests of patients that the implementation timeline is as rapid as possible.

Relevant local clinical guidelines, care pathways, and protocols should be reviewed in the light of this guidance and revised accordingly.

This guideline should be used in conjunction with the National Service Framework for Long Term Conditions (see www.doh.gov.uk/nsf/longterm/longterm.htm).

Suggested audit criteria are listed in Appendix E of the short version original guideline document and in Appendix 14 of the full version. These can be used as the basis for local clinical audit, at the discretion of those in practice.

IMPLEMENTATION TOOLS

Audit Criteria/Indicators
Chart Documentation/Checklists/Forms
Clinical Algorithm
Foreign Language Translations
Patient Resources
Resources

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Patient-centeredness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

National Collaborating Centre for Acute Care. Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults. London (UK): National Institute for Clinical Excellence (NICE); 2003 Jun. 248 p. [373 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2003 Jun

GUIDELINE DEVELOPER(S)

National Collaborating Centre for Acute Care - National Government Agency [Non-U.S.]

SOURCE(S) OF FUNDING

National Institute for Health and Clinical Excellence (NICE)

GUIDELINE COMMITTEE

Guideline Development Group

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The Guideline Development Group were asked to declare any possible conflict of interest they might have that could interfere with their work on the guideline. No conflicts of interest were declared.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format [PDF] format from the National Institute for Health and Clinical Excellence (NICE) Web site.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Head Injury: triage, assessment, investigation and early management of head injury in infants, children and adults. NICE guideline. 2003 Jun. 68 p. Available in Portable Document Format [PDF] format from the National Institute for Health and Clinical Excellence (NICE) Web site.
- Head injury. Triage, assessment, investigation and early management of head injury in infants, children and adults. Clinical algorithms 1-4. 2003 Jun. Available in Portable Document Format [PDF] format from the NICE Web site.

Additional Implementation Tools, including Audit Criteria and Observation, Referral, and Discharge Forms are included as Appendices to the original guideline document.

PATIENT RESOURCES

The following is available:

- The early management of head injuries. Understanding NICE guidance - information for patients, carers and families, and the public. London: National Institute for Health and Clinical Excellence. 2003 Jun. 36 p. Available in English and Welsh in Portable Document Format (PDF) from the National Institute for Health and Clinical Excellence (NICE) Web site.

Print copies: Available from the National Health Service (NHS) Response Line 0870 1555 455. ref: N0235. 11 Strand, London, WC2N 5HR.

NGC STATUS

This NGC summary was completed by ECRI on January 5, 2005. The information was verified by the guideline developer on May 11, 2005.

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Date Modified: 10/2/2006